EXHIBIT 10
Expert Report of Joel Steckel

IN THE UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

STEPHANIE WEDRA, individually on behalf of herself and on behalf of all others similarly situated, Plaintiff, v. CREE Inc., Defendant.	Case No. 7:19-cv-03162

EXPERT REPORT OF JOEL H. STECKEL, PH.D.

April 30, 2021

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I. INTRODUCTION

A. Qualifications

1. I am a Professor of Marketing and the Vice Dean for Doctoral Education at the Leonard N. Stern School of Business, New York University, where I have taught since January 1989. I was the Chairperson of the Marketing Department for six years, from July 1998 to June 2004. I also served as the Acting Chairperson of the school's Accounting Department from August 2016 to August 2019. Prior to my promotion to Vice Dean, I was the faculty director of the Stern School Doctoral Program for five years, from May 2007 to July 2012. I have also held either permanent or visiting faculty appointments at the Graduate School of Business, Columbia University; the Anderson Graduate School of Management, U.C.L.A.; the School of Management, Yale University; and the Wharton School, University of Pennsylvania. I received my B.A. *summa cum laude* from Columbia University in 1977, and M.B.A. (with distinction), M.A., and Ph.D. degrees from the Wharton School, University of Pennsylvania in 1979, 1980, and 1982, respectively. I was elected to *Phi Beta Kappa* at Columbia University and *Beta Gamma Sigma* at the Wharton School. These are the national honor societies for the respective disciplines I studied at these institutions.

2. I was the Founding President of the INFORMS (Institute for Operations Research and Management Science) Society on Marketing Science ("ISMS"), the foremost professional group for the development and application of management science theory and tools in marketing. In addition, I am a member of the American Marketing Association, the American Statistical Association, the Association for Consumer Research, the American Psychological Association, the American Association for Public Opinion Research, and the Society for Consumer Psychology.

3. My fields of specialization within marketing include marketing research methodologies such as conjoint survey design and analysis, marketing and branding strategies, the relationship between marketing research and marketing strategy, electronic commerce, managerial decision-making, and consumer decision-making. I am an author of four books and over 50 articles. In the course of my scholarly research, teaching, and consulting work, I have studied issues of marketing research, branding, and their roles in consumer choice and marketing strategy.

4. One of the books I co-authored is a textbook entitled *Marketing Research*. This book has been adopted at several of the country's major business schools. During one of my sabbaticals I served as an in-house consultant at the market research firm, Directions for Decisions ("DFD"), headquartered in Jersey City, New Jersey. DFD's growth allowed it to be acquired by RTi Research, another research firm, headquartered in Norwalk, Connecticut.

5. I have sat on the editorial boards of many major journals over the years. From July 2010 until March 2017, I served as a co-Editor-in-Chief of the journal *Marketing Letters*. In that capacity, I evaluated over 200 research studies each year for over six and a half years. I served as a gatekeeper, deciding which articles were published in the journal, and which were not. As such, my evaluations of the scientific reliability and validity of each research study were subject to the scrutiny of the academic community. The community considers any study that appeared in the journal that did not conform to the scientific standards of my profession as a black mark on my record. I consider the fact that the journal's publisher, the international firm, Springer-Verlag, kept me on long past the expiration of my term (July 2014) as validation of my performance in evaluating research. My professional qualifications are described further in my curriculum vitae, which is attached as **Appendix A**.

6. During the course of my professional career, I have designed, conducted, supervised, and/or evaluated hundreds of consumer surveys, including conjoint surveys. In that work, I have formulated sampling strategies, designed questionnaires, analyzed data, and interpreted results. I have also evaluated similarly purposed survey work performed by others. During my career, I have taught M.B.A. students about, written textbook chapters on, published research papers about using, and lectured executives on conjoint surveys and analysis.
7. I have served as an expert witness on marketing research, marketing strategy, branding, trademark, and issues related to consumer decision-making in a variety of litigation matters. In the past four years, I testified as an expert witness in the matters listed in **Appendix B**.
8. My rate of compensation for this assignment is $1,000 per hour. Others at Analysis Group, Inc. ("AG"), an economic and litigation consulting firm headquartered in Boston, Massachusetts, performed part of the work for this assignment under my direction. I receive additional compensation from AG related to the work of others under my supervision. No compensation is contingent upon the outcome of this research or of the case.

B. Background

9. According to the Complaint in this matter, Stephanie Wedra ("Plaintiff") "purchased 60 Watt and 75 Watt Cree LED lightbulbs from Home Depot during the class period [April 2013 to present]."[1] Prior to purchasing the bulbs, Plaintiff "viewed some internet advertisements by Cree" and "relied on these representations" in informing her decision to purchase the light

[1] Class Action Complaint, *Stephanie Wedra, individually and behalf of all others similarly situated, v. Cree Inc.,* Case No. 7:19-cv-03162, United States District Court Southern District of New York, April 9, 2019 ("Complaint"), ¶ 41; Memorandum of Law in Support of Plaintiff's Motion for Class Certification, *Stephanie Wedra, individually and behalf of all others similarly situated, v. Cree Inc.,* Case No. 7:19-cv-03162, United States District Court Southern District of New York, February 26, 2021, ("Plaintiff's Memorandum"), p. 1.

bulbs.[2] Plaintiff "paid approximately between $10 and $20" for a 2-pack of 60 watt Cree LED light bulbs.[3] Plaintiff also seeks to represent a class defined as: "All persons in New York who purchased A-type 60 watt and 100 watt Cree LED Lightbulbs for end use, and not resale, during the period from April 2013 to present."[4]

10. As of the filing of the complaint for this case, the Defendant, Cree, Inc. ("Cree"), was headquartered in Durham, North Carolina.[5] Cree manufactures, markets, and sells three categories of LED light bulbs, "Standard A-Type, Reflector (Flood/Spot), and Specialty."[6] According to the Complaint, Cree markets its light bulbs with packaging containing "estimated lifetime use and energy saving" as well as "an 'estimated' cost savings for the purchaser buying the product, which range based on the cost of the product and the advertised lifespan for the LED lights."[7] Cree also allegedly includes such marketing statements on their website as well as in other marketing materials.[8]

11. In the Complaint, Plaintiff alleges that "Cree's LED bulbs are sold with packaging indicating that the bulbs come with a 10 Year Warranty and/or are '100% Satisfaction Guaranteed'" as well as "estimated lifetime use and energy saving, indicating that the bulbs will save consumers money in the long term despite their high purchase price point" and that "the

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2 Complaint, ¶¶ 41-42.

3 Plaintiff's Memorandum, p. 7.

4 Plaintiff's Memorandum, p. 1.

5 Complaint, ¶ 19. I understand that Ideal Industries acquired the Cree Lighting business in May 2019.

6 Complaint, ¶ 26.

7 Complaint, ¶¶ 22, 34.

8 Complaint, ¶¶ 28, 30.

useful life of the product will be at least 10 years or more."[9] Plaintiff claims that Cree "created an overall marketing scheme that overpromises the longevity of the Lightbulbs"[10] and that the "the longevity representations (i.e., 45+ years), the 100% satisfaction guarantee, the comparative statements in regard to other light bulbs, and the other marketing and advertising of the Lightbulbs detailed herein, collectively signal to the consumer that the bulbs will significantly outlast traditional incandescent bulbs … [which] is not true."[11] Plaintiff alleges that "[Cree's] LED Lightbulbs do not last nearly as long as advertised" and that "Plaintiff and the Class members purchased, purchased more of, and/or paid more for, the Products than they would have had they known the truth about the Products."[12] Dr. Andreas Groehn refers to the representations of lifetime and the satisfaction guarantee as the "Longevity Representation" and the "Guarantee Representation," respectively.[13]

12. Plaintiff retained Dr. Groehn to "present a methodology capable of measuring damages for all class members."[14] In particular, Dr. Groehn describes his intent at the class certification stage is "to determine whether Plaintiffs and the proposed class members suffered any injury and, if so, to present a damages model showing that their damages can be measured on a class-wide basis."[15]

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[9] Complaint, ¶ 22. Plaintiff also notes that "Cree packaging boasts that their bulbs have a life of as much as '45+ years' or more depending on the bulb." Complaint, ¶ 23.

[10] Complaint, ¶ 24.

[11] Complaint, ¶¶ 24-25.

[12] Complaint, ¶¶ 10, 13.

[13] Report of Dr. Andreas Groehn, *Stephanie Wedra, Individually and behalf of all others similarly situated, v. Cree Inc.,* Case No. 7:19-cv-03162, United States District Court Southern District of New York, February 26, 2021, ("Groehn Report"), ¶ 14.

[14] Groehn Report, ¶ 9.

[15] Groehn Report, ¶ 9.

C. Assignment

13. I have been retained by Katten Muchin Rosenman LLP, counsel for Cree, to assess whether or not Dr. Groehn's proposed theoretical and empirical approaches reflect scientifically appropriate standards and whether or not the results from his proposed study design could be relied upon for the purposes he intends. Specifically, I was asked to consider the extent to which Dr. Groehn "presented a theoretical model to show how consumers would have to be compensated for the economic loss they incurred because they did not receive the expected value from the Products."[16] I was also asked to assess whether or not he reasonably and appropriately "described the methodology for a conjoint analysis to estimate empirically the shift in demand predicted by the theoretical model to estimate the economic loss to class members."[17] Lastly, I was asked to determine whether Dr. Groehn's proposed approach provides a valid measure of "class wide damages."[18]

14. In formulating my opinions, I relied upon the items cited in the footnotes to this report and in **Appendix C**.

D. Summary of Conclusions

15. My work in this matter has led to the following conclusions:

    a. Dr. Groehn's conjoint analysis study proposal lacks the specificity or detail to determine whether his study would be scientifically valid or methodologically sound. His conclusion that he can calculate damages is completely unsupported.

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16 Groehn Report, ¶ 77.

17 Groehn Report, ¶¶ 77-78.

18 Groehn Report, ¶ 79.

b. To the extent that Dr. Groehn does present potential details of his proposed study, he commits major flaws that would undermine any findings his work produces. His presentation includes violations of several fundamental tenants of good survey design in general, and conjoint analysis in particular.

c. Finally, Dr. Groehn fails to present any approach to calculating damages for the alleged harm consumers suffered. His vague discussion of a damages calculation presents an approach that is completely disconnected from the market for light bulbs; his approach ignores any potential variation in purported harm across class members.

II. DR. GROEHN'S PROPOSED STUDIES ARE VAGUE AND CANNOT BE IMPLEMENTED AS DESCRIBED IN HIS REPORT

16. The Groehn Report considers three different methodologies as a basis for studying economic loss: hedonic pricing,[19] contingent valuation,[20] and conjoint analysis.[21] Dr. Groehn rejects contingent valuation, leaves open the possibility of a hedonic regression without any further elaboration of method or theory,[22] and indicates that he will most likely conduct a conjoint analysis.[23]

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[19] Groehn Report, ¶¶ 39-42.

[20] Groehn Report, ¶ 45.

[21] Groehn Report, ¶¶ 46-48.

[22] Groehn Report, ¶ 42. Dr. Groehn does contradict himself seven paragraphs later by citing downsides and inapplicability (*see* Groehn Report, ¶ 49). He continues to refuse to commit to a particular analysis when he leaves open the possibility of hedonic analysis in his deposition (*see*, Virtual Videotaped Deposition of Dr. Andreas Groehn, *Stephanie Wedra, Individually on behalf of herself and all others similarly situated, v. Cree Inc.*, Case No.:19-cv-03162, United States District Court Southern District of New York, April 9, 2021 ("Groehn Deposition"), pp. 22-23).

[23] Groehn Report, ¶ 49.

17. Dr. Groehn fails to present a clear, implementable, and scientifically valid method for his conjoint analysis in his report.[24] Instead he relies on broad statements such as "In designing, conducting and analyzing my survey I will follow established guidelines for survey research."[25] While this is a minimum expectation regarding a survey expert's work, Dr. Groehn does not provide enough detail to allow for any verification of his approach. The Groehn Report lacks details about the attributes to be examined in his study. It also lacks sufficient discussion about how the survey data would be analyzed. At one point Dr. Groehn states, "[t]he methodology is flexible and can be modified to incorporate any additional aspects if the Court deems necessary."[26] When asked in his deposition, "Is the methodology that you were asked to present complete at this point?" Dr. Groehn responded, "[y]es. But I also say that if additional information becomes available, then I would be prepared to revise as appropriate."[27] Being far from complete, Dr. Groehn's presentation of his methodology is extremely adaptable in the non-committal sense of the term. His adaptability is nothing more than an excuse for not being prepared to describe exactly what it is that he plans to do.[28]

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[24] Dr. Groehn also fails to provide any description of how he might conduct a hedonic analysis, which further begs the question of how he might conduct this type of analysis.

[25] Groehn Report, ¶ 52.

[26] Groehn Report, ¶ 79.

[27] Groehn Deposition, pp. 50-51. Although Dr. Groehn suggests his methodology is "complete," he concedes that he has not drafted the materials for his proposed study. *See* Groehn Deposition, p. 51 ("Q. And have you drafted the materials that you would use for a conjoint survey? A. I have examples of -- have a screenshot of a proposed conjoint screen in Figure 11, but I have not yet designed the questionnaire.").

[28] Dr. Groehn both refuses to commit to a method for his analysis and to even commit to using a single analysis. *See* Groehn Deposition, p. 21. ("Q. But in the report, you reject hedonic pricing as the appropriate method for assessing damages from this case, right? A. I think that hedonic pricing has potential to be used, but to give us a complete answer, I believe that conjoint surveys or conjoint analysis would be appropriate at this point. I might -- if I get additional data, I might revisit that opinion. Q. So you might change the methodology by which you would use -- the methodology which you would use to assess damages in the case? A. So hedonic pricing could be a methodology in addition to conjoint analysis. Q. So you would use two methodologies, then? A. You could use two methodologies, yes.")

18. Conjoint analysis is one of the (if not the) most common marketing research tools used in practice today. Its purpose is to measure consumer preferences for products conceived as bundles of attributes (sometimes called "features"). Sometimes referred to as "tradeoff analysis," the name "conjoint analysis" comes from the principle that when making product choices consumers consider attributes jointly; i.e., conjoint comes from "consider jointly." For example, consumers may make credit card choices based on brand name (e.g. Amex, Mastercard, Visa), interest rates (e.g. 5%, 10%, 15%), credit limit (e.g. $10,000, $30,000, $50,000), and annual fee (e.g. $0, $75 per year). In this example, the attributes or features are brand name, interest rates, credit limit, and annual fee. The specific manifestations of each attribute (i.e., the terms in the parentheses) are termed the "levels" of the attributes. Consumers trade off the levels of these attributes – they compare benefits of each attribute level across products, and find the product with best mix of attribute levels for them. For example, they may be willing to accept an annual fee in exchange for a higher credit limit or lower interest rate. Given that they structure consumer choices, the attributes and levels provide the backbone for any conjoint analysis. As such, "(d)efining proper attributes and levels is arguably the most fundamental and critical aspect of designing a good conjoint study."[29] Without having those in place, it is impossible to assess the validity of a proposed conjoint study. Such a task would be like assessing a credit card's value without knowing the interest rate or the credit limit.

[29] Orme, Bryan K., *Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research*, 4th ed., Research Publishers LLC, 2020, ("Orme (2020)"), p. 49.

19. A valid conjoint survey should consist of attributes that are important and relevant to consumers in their purchase decisions.[30]

20. Dr. Groehn's report lists a variety of potential attributes that *might* be included in his conjoint survey.[31] However, he does not identify those attributes that he plans to include in his study. Nor does he take pains to identify a particular method to identify and select attributes.[32]

21. Some attributes need to be included. Being the focus of the study and Dr. Groehn's objectives, attributes representing longevity and guarantee representations must be included.[33] Since Dr. Groehn desires to measure economic loss, as the only economic attribute, price must be included to enable the calculation of economic damages. Beyond those, other attributes must be included to mask the objective of the study, among other reasons.[34] The remaining attributes should be ones that are important and relevant to consumers in their purchase decisions.[35] In order to generalize the findings of the conjoint

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[30] "Several alternate means exist for identifying the attributes which are relevant to consumers in forming their preferences. A preliminary data collection effort, questioning consumers regarding attributes important to them, usually helps in identifying those attributes that are most frequently regarded as relevant […] repertory grid, focus group interviews, or judgments of product managers, retailers and others knowledgeable about the product/service and its uses can be used for this purpose." Green, Paul. E., and V. Srinivasan, "Conjoint Analysis in Consumer Research: Issues and Outlook," *Journal of Consumer Research*, Vol. 5, No. 2, 1978, ("Green and Srinivasan"), pp. 104-105. *See also*, Lehmann, Donald R., Sunil Gupta, and Joel H. Steckel, *Marketing Research*, Addison-Wesley Educational Publishers Inc., 1998, ("Lehmann, Gupta, and Steckel"), p. 546; Orme (2020), pp. 49-52.

[31] Groehn Report, Table 2.

[32] Dr. Groehn states, "Table 2 lists a preliminary list of attributes and their respective level to be included in the conjoint survey." He then proposes multiple methods for determining the attributes he might include in his survey. *See*, Groehn Report, ¶ 63. *See also*, Groehn Deposition, p. 101 ("Q. Have you made a final determination on the attributes that you intend to include in the conjoint analysis? A. Table 2 has the attributes that I currently consider, but there are other options for the attributes, particularly for the decoy attributes, as I call them, that could be included.").

[33] Of note, Dr. Groehn does not make clear what attributes are tied to these two representations. If he were to choose multiple attributes to represent a single representation, his work would likely suffer from overlapping attributes (Orme (2020), p. 51).

[34] Groehn Report, ¶ 55.

[35] "Several alternate means exist for identifying the attributes which are relevant to consumers in forming their preferences. A preliminary data collection effort, questioning consumers regarding attributes important to them,

analysis, the tradeoffs respondents make in the study must mimic those that consumers make in the marketplace.[36] Ignoring attributes that consumers consider important can increase the value of the at-issue attributes included in Dr. Groehn's conjoint survey – for example, by giving them more emphasis in comparison to other attributes.[37]

22. The attributes listed in Table 2 of the Groehn Report appear to be chosen arbitrarily and without specific guidance as to how many and which attributes he would select from this list. The Table 2 attributes that Dr. Groehn is considering appear to be based on two data sources, an analysis of 2,112 customer comments submitted to Cree and a market research study conducted by Piper Jaffray which asked "What is the most important attribute for you when choosing a light bulb?"[38] Summary graphs of these two data sources are included in the Groehn Report as Figures 9 and 10.

23. Dr. Groehn states that the 2,112 customer comments "analysis gives an indication which attributes consumers cared about when purchasing LED lights during the class period."[39] That is not true. In his deposition he clarifies that he does not know how the data for this analysis (summarized in Figure 9) were collected or how they were used. Furthermore, he did not review the analysis.[40] He does not even know whether the attribute references in the

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usually helps in identifying those attributes that are most frequently regarded as relevant […] repertory grid, focus group interviews, or judgments of product managers, retailers and others knowledgeable about the product/service and its uses can be used for this purpose." Green and Srinivasan, pp. 104-105. *See also*, Lehmann, Gupta, and Steckel, p. 546.

36 Rao, Vithala R., *Applied Conjoint Analysis*, Springer, 2014, ("Rao"), pp. 127-129.

37 Orme (2020), pp. 49-50; Yates, J. Frank, Carolyn M. Jagacinski, and Mark D. Faber, "Evaluation of Partially Described Multiattribute Options," *Organizational Behavior and Human Performance*, Vol. 21, 1978, ("Yates, Jagacinski, and Faber"), p. 248.

38 Groehn Report, ¶ 56 and Figure 10.

39 Groehn Report, ¶ 56.

40 Regarding Figure 9, Dr. Groehn stated, "…I did not dive into whether this was coded correctly. I know from my own experience that coding free form responses in surveys is very painful and opens up for interpretation."

comments were related to attributes the customers considered important when purchasing bulbs.

24. Furthermore, Dr. Groehn twists the customer comments tabulated in Figure 9 into a proverbial knot while trying to use it to assemble an attribute list. First, he wants to use data to determine which are the most important attributes to include.[41] Next, he asserts that "(s)ome attributes, including 'Brightness/Light Output', 'Bulb design / size/build/weight / quality' are standardized and I do not plan to vary these within the survey."[42] However, according to Figure 9, 'Brightness/Light Output' is the third 'most important' attribute that consumers care about when deciding what to purchase. This interpretation is inconsistent with the attribute being standardized. If an attribute is standardized across choice alternatives, it cannot possibly be of any importance in purchase decisions. The only attributes that matter in choice are the ones that are not standardized and vary across alternatives.[43] So here is where Dr. Groehn's logic fails. Either 'Brightness/Light Output' is important in decision making, as his interpretation of the customer comment suggests, or it is standardized across choice alternatives, as he asserts. It cannot possibly be both.

Groehn Deposition, p. 109. As such, there is no guarantee that the number of comments are indicative of relative importance of attributes in the consumer decision process. When questioned on Figure 10 he stated, "All I could see is that Cree relied on -- in one form or another, Cree relied on their information." Groehn Deposition, pp. 108-112.

41 Groehn Report, ¶¶ 55-60.

42 Groehn Report, ¶ 58.

43 Dr. Groehn proposes a set of "decoy attributes" as well, but concedes that these are subject to change. *See* Groehn Deposition, p. 119 ("Q. In your view, are the decoy attributes in Table 2 better for that purpose than the decoy attributes in Paragraph 62? A. I don't think that it matters much, and I cannot say that one is better than the other. It is possible that we find out during the pretest that people might not understand fully what a specific attribute means or that they have -- that they have no true preference, no true willingness to pay for one of these attributes, and then that could be a reason to replace that attribute in Table 2 with one of the ones that is in Paragraph 62.").

25. Figure 10 only gives us a glimpse into the Piper Jaffray study question on attribute importance. We do not know the context of the question, or what attributes were asked about. Apparently Dr. Groehn does not either.[44] Without an explanation of how the data underlying Figures 9 and 10 were gathered and analyzed, Dr. Groehn cannot reasonably present them as the basis for the attributes he selects.

26. Making matters worse, Dr. Groehn proposes two potential methods that he might use to determine which of his proposed attributes to include in his conjoint survey. He stated "I will make the final determination of which attributes and levels to include after reviewing research conducted on behalf of Defendant. If such research is not available, I plan to conduct a pilot study with the same survey population as the conjoint survey."[45] He does not go into sufficient detail on either. First, presumably he has already reviewed the research "conducted on behalf of Defendant" in coming up with Figures 9 and 10. If he has not reviewed it all, his proposal (i.e., the Groehn Report) is premature. Second, Dr. Groehn does not does not explain his pilot study sufficiently enough for me to vet it. He writes, "In the pilot study I will present various attributes of LED lightbulbs to survey participants and ask them to identify the attributes most relevant to them. I will apply statistical tests to assess whether the importance of attributes varies between groups of participants."[46] This description lacks any definition of method; it is, at best, a vague statement of intent. I am

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44 *See* Groehn Deposition, pp. 111-112 ("Q. Do you know the purpose for which they collected the data that you depict here? A. I do not. Q. Any familiarity with their methodology for collecting that data? A. All I could see is that Cree relied on -- in one form or another, Cree relied on their information. If I remember correctly, these were regular reports provided by Piper Jaffray…Q. I said regardless of who you've spoken to, you don't know how Cree has used these reports or if they've used the reports, right? […] A. Without speaking to somebody at Cree, unless somebody else was able to provide that information, I'm currently not in a position to know how Cree used these reports.").

45 Groehn Report, ¶ 63.

46 Groehn Report, ¶ 63.

puzzled as to why Dr. Groehn has not done this work prior to writing his proposal. Even if he has not conducted the pilot study yet, he should present a scientifically valid framework and description of the work he intends to do for the pilot study. The pilot study does not receive as much as a full paragraph in the Groehn Report. Dr. Groehn does not explain which potential attributes he might include in the pilot study, how they will be selected, or how the pilot study would be administered. His proposed pilot study is little more than an allusion to a method; it lacks any concrete method that can be compared to accepted scientific practices. As mentioned earlier, attribute selection plays a key role in a conjoint analysis, and failure to carefully define distinct attributes in the survey will ultimately undermine any conclusions from the survey. Not only does Dr. Groehn not provide detail on the attributes and levels he would use in the conjoint analysis, he does not provide detail on how he would uncover them.[47] Finally, Dr. Groehn presents an equally vague description of his approach to actually calculating or estimating class-wide damages. He states that "[t]he economic loss per unit can then be estimated by comparing the demand for a product with the advertised attribute to the demand without the advertised attribute, either in absolute value or as a percentage of the respective purchase price."[48] This is again a statement so sparse on detail that a researcher cannot conduct a specific damages calculation with Dr. Groehn's report as a guide. The Groehn Report does not describe the calculation in sufficient detail for me to be able to validate it. Furthermore, as I shall discuss later, Dr. Groehn simply assumes away the supply-side of the market in his description of a damages calculation.

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[47] *See* Groehn Deposition, p. 51 ("Q. Have you composed a pretest for this matter? A. Let me look at -- in Paragraph 66, I say that I intend to conduct a pretest, but I have not yet conducted a pretest. Q. Even if you haven't conducted one, have you drafted one, the materials that you will use for a pretest? A. No.").

[48] Groehn Report, ¶ 72.

III. THE SURVEY DETAILS THAT DR. GROEHN DOES INCLUDE IN HIS PROPOSAL SUFFER FROM FLAWS THAT WOULD INVALIDATE HIS RESULTS

A. Dr. Groehn does not recognize the appropriate target population

27. In general, surveys, including conjoint surveys, collect data from a sample of respondents with an eye towards generalizing the results from those data towards a larger group of individuals. That larger group of individuals is called the target universe or population. Therefore, defining a target population is one of the most crucial steps in conducting surveys. To be able to achieve generalizability, researchers must carefully consider both the population they seek to understand and the group they will use to gather their responses. As Professor Shari Diamond makes clear, "The definition of the relevant population is crucial because there may be systematic differences in the responses of members of the population and nonmembers."[49] In simple terms, "[a] survey that provides information about a wholly irrelevant population is itself irrelevant."[50]

28. Not only does Dr. Groehn fail to define a target population, he fails to recognize one, even though it is right under his nose. Given the class-action nature of this specific case, the target population necessarily has to be the purported class. The class is the body to which Dr. Groehn needs to generalize his results. While he acknowledges the importance of the guidelines Professor Diamond establishes in the "Reference Guide on Survey Research," his report describes his intended sample criteria without defining a target population.[51] This

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[49] Diamond, Shari S., "Reference Guide on Survey Research," *Reference Manual on Scientific Evidence*, 3rd Edition, National Academies Press, 2011, ("Diamond"), p. 377.

[50] Diamond, p. 377.

[51] Groehn Report, ¶¶ 52-53.

omission leads him to ignore a crucial criterion for being included in the study: The respondent must have been a past purchaser of CREE light bulbs.

B. Dr. Groehn's proposed conjoint survey does not reflect the real world light bulb marketplace

29. A valid conjoint survey should consist of attributes that are important and relevant to consumers (the target population) in their purchase decisions.[52] Dr. Groehn's conjoint survey, as he is currently planning it, presents consumers with a more or less arbitrary set of attributes. We have no idea whether any or all of them are important in the consumer choice process. The task Dr. Groehn proposes to present to respondents likely not only lacks realism, but it fails to present choice scenarios that draw on cognitive tradeoffs similar to those respondents would face in the store. Without presenting a scenario that reflects such choices, Dr. Groehn cannot use his conjoint analysis to assess actual consumer preferences.

30. In a similar vein, Dr. Groehn's report creates an unrealistic set of choices by directing respondents to focus only on Cree 10 Watt LED light bulbs of size A19.[53] He intentionally excludes both other brands of LED light bulbs and other light bulb technologies, such as incandescent, halogen, and compact florescent ("CFL") bulbs.[54] Without these types of bulbs, Dr. Groehn's conjoint analysis does not and cannot reflect the marketplace choices consumers face when purchasing Cree bulbs. U.S. households use a variety of light bulb

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[52] "Several alternate means exist for identifying the attributes which are relevant to consumers in forming their preferences. A preliminary data collection effort, questioning consumers regarding attributes important to them, usually helps in identifying those attributes that are most frequently regarded as relevant […] repertory grid, focus group interviews, or judgments of product managers, retailers and others knowledgeable about the product/service and its uses can be used for this purpose." Green and Srinivasan, pp. 104-105. *See also*, Lehmann, Gupta, and Steckel, p. 546.

[53] Groehn Report, Figure 11.

[54] Groehn Deposition, pp. 98-101.

technologies, with most using a mix of incandescent and CFL bulbs.[55] Consumer and household choices are not restricted to Cree 10 Watt LED light bulbs of size A19.[56] A simple check of the shelves of hardware stores demonstrates that LED bulbs sit next to incandescent, CFL, and halogen light bulbs – LED's in general, and Cree LED bulbs in particular, do not compete in their own marketplace only amongst themselves. As a result, Dr. Groehn's conjoint survey will present respondents with choice sets that do not reflect the breadth of products that they would consider in the marketplace and therefore cannot replicate the myriad choices presented to consumers as they make a choice in store.[57]

31. Even if we assume that Dr. Groehn's attributes in Table 2 are the right ones (which we cannot), the corresponding levels are not realistic. Dr. Groehn's "Warranty" attribute levels are not based on actual representations present in the LED light bulb marketplace.[58] As another example of lack of market realism, Table 2 presents two levels describing a "Color" attribute (2700K and 5000K). However, in the real world consumers see many options for light bulb color (including bulbs that can have the color adjusted by the consumer via a

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55 "American Households Use a Variety of Lightbulbs as CFL and LED Adoption Increases," *Today in Energy*, U.S. Energy Information Agency, May 8, 2017, https://www.eia.gov/todayinenergy/detail.php?id=31112, accessed on March 25, 2021; "Table HC5.1 Lighting in U.S. Homes by Housing Unit Type, 2015" *U.S. Energy Information Administration*, February 2017, https://www.eia.gov/consumption/residential/data/2015/hc/php/hc5.1.php, accessed on April 23, 2021, ("EIA Lighting"); "The Light Bulb Revolution," Energy Star, October 2017, ("Energy Star"), Figure 8.

56 Further, other recent data on light bulbs shows that halogen bulbs actually have the largest share of market penetration, with recent increases in LED market penetration driven by falling prices (often as a result of utility incentive programs). See Energy Star, Figure 4 and p. 5.

57 Choice Based Conjoint are used to "predict real marketplace choices." As a result "the design of a choice-based conjoint study is far more complex due to the intricacies of generating an 'efficient' series of choice sets." *See* Rao, p. 128.

58 Groehn Report, Table 2.

smartphone app).[59] Because, in a matter such as this one, choice based conjoint analysis seeks to approximate the decisions made in the actual marketplace, ignoring an array of attribute levels demonstrates inadequate survey design.[60]

C. Dr. Groehn's proposed conjoint survey relies on poorly defined and overlapping levels of attributes

32. The proposed Groehn conjoint survey cannot provide valid results due to the vague and imprecise way it defines product attributes to respondents. In general, in a choice based conjoint survey, such as the one Dr. Groehn is contemplating, respondents select their most preferred product from a number of displayed product alternatives based on the product attribute levels displayed by each product.[61] That is, respondents observe which attribute levels a certain product possesses and choose among product alternatives based on those attribute levels. For the results of a conjoint survey to be valid, it is crucial that respondents understand these attributes – they must be clearly defined, non-vague, and easy-to-grasp. The survey Groehn proposes does not fulfill these requirements. For example, Dr. Groehn does not sufficiently define the comparative better statement attribute and therefore has no way of knowing how respondents will interpret the attribute. He does not provide respondents with a concrete alternative to the claim. Specifically, respondents are either told that the light bulb

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59 Groehn Report, Table 2; Home Depot Website, https://www.homedepot.com/b/Lighting-Light-Bulbs-LED-Light-Bulbs/Cool-White/Standard/A15/A19/N-5yc1vZbm79Z1z0vvqnZ1z0vvrdZ1z0wujbZ1z17hnz?NCNI-5&storeSelection=, accessed on April 29, 2021.

60 Rao, pp. 128-130.

61 Although phrased improperly, Dr. Groehn appears to be planning to present his respondents with 15 binary choices (choices sets consist of two products). As such respondents will see 30 products. Although it does not appear to be settled, each product would consist of six binary attributes and price with five levels (*see* Groehn Report, ¶ 65 and Figure 11).

"Our LED bulbs work better and last longer" or "Blank."[62] Respondents are not told what "Blank" means and how they should interpret the lack of a claim.

33. For example, some respondents may think "Blank" means that the light bulb will last as long as other LEDs while others may think that "Blank" means that the light bulb will last, for example, three times longer than another LED light bulb. Dr. Groehn has no way of knowing how respondents interpreted "Blank," or if they will infer its meaning from other attributes. If respondents do indeed infer meaning from other attributes, these inferences would likely be inconsistent not only across choice tasks, but within them as well. "Blank" is not an attribute level, but essentially a lack thereof.

34. When faced with an attribute level of simply "Blank," respondents are missing information about how long the light bulb lasts relative to other LED light bulbs. Academic literature has demonstrated that when consumers are missing information that they would expect to see about an attribute, they tend to perform a "discounting of alternatives with missing information," in which they overcompensate for the missing information and perceive a lower value.[63] For example, a study of consumers' inferences about missing product characteristics in beer found that, in the absence of a description, consumers inferred a below-average level for the missing characteristic.[64] Similarly, a study of subjects choosing college courses based on a set of attributes found that only partially described courses were likely to be devalued by respondents, who "respond to such options as if their status were

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62 Groehn Report, Table 2.

63 Huber, Joel and John McCann, "The Impact of Inferential Beliefs on Product Evaluations," *Journal of Marketing Research*, Vol. 19, No. 3, 1982, ("Huber and McCann"), p. 331. *See also*, Meyer, Robert J., "A Model of Multiattribute Judgments under Attribute Uncertainty and Informational Constraint," *Journal of Marketing Research*, Vol. 18, No. 4, 1981, pp. 428-441.

64 Huber and McCann, p. 331.

below par on the dimension that is not described" but do not automatically infer the lowest possible level.[65]

35. While some light bulbs in reality may bear a claim that others do not, the setup of Dr. Groehn's conjoint survey explicitly draws respondents' attention to the lack of a claim, which they may not have otherwise noticed in a real-life purchasing situation. In Dr. Groehn's conjoint survey, "Blank" is not a clear attribute-level definition. To ensure meaningful results, the statistical model that Dr. Groehn employs as part of his ultimate analysis requires that precise attribute-level definitions be provided in the conjoint survey. Dr. Groehn's lack of clear attribute-level definitions will render the outcomes of his conjoint survey — including part-worths, demand curves, and willingness-to-pay values — invalid.

36. Dr. Groehn alludes to a plan to conduct a pre-test in order to "assess whether respondents understand the questions."[66] The single paragraph discussing this pre-test presents no method for conducting the study, only saying, "Should the pre-test indicate that respondents do not understand the survey questions well, I will revise the questionnaire and re-launch the survey."[67] Furthermore, Dr. Groehn misses the point of a pretest. Yes, it needs to examine understanding, but in the typical choice based conjoint study the critical questions have been pretested over and over and are easy to understand. What needs to be pretested are the attributes and levels. The usefulness of any conjoint study relies on respondent understanding of these. An improperly designed or conducted pre-test could obscure fundamental flaws in Dr. Groehn's survey results, and ultimately his estimation of damages.

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65 Yates, Jagacinski, and Faber, pp. 248-249.

66 Groehn Report, ¶ 66. This pre-test differs from Dr. Groehn's "pilot study," which he intends to use to determine which attributes to include in his proposed conjoint survey. He describes his pre-test as an approach to ensuring that respondents understand his attributes and attribute levels as they are included.

67 Groehn Report, ¶ 66.

IV. DR. GROEHN DOES NOT PRESENT A VALID APPROACH TO CALCULATING DAMAGES FOR THE PROPOSED CLASS

A. Dr. Groehn's economic framework is vague and imprecise

37. Dr. Groehn begins discussion of his economic framework by giving his interpretation of New York's consumer protection laws. He says they "seek(s) to make consumers ***whole*** [emphasis added] had they known at the point and time of their purchase that Defendant's representations on the longevity were false."[68] However, he neglects to define what it means in his framework to make consumers whole. Is it reducing consumer surplus? Is it by giving them the benefit of the bargain? Without knowing exactly what it means to make consumers whole, it is impossible to know whether his (or any) empirical approach accomplishes it.

B. Dr. Groehn's proposed damages calculation fails to connect to his economic theory

38. Dr. Groehn's conceptualization of economic loss or damages is reflected by the distance "t" in his Figure 6.[69] Nowhere in his report does he connect the results of his proposed conjoint analysis to the depicted distance "t". The links that would be necessary for tying the various theoretical fragments in the Groehn Report together are missing. Detailed study of Dr. Groehn's report leaves the reader without an understanding of how and why t reflects an approach that would make consumers whole and how the results of a conjoint analysis help determine t.

39. In addition, Dr. Groehn's methodology for calculating consumers' willingness-to-pay for benefits of the longevity and guarantee claims is not in line with accepted methodologies of conjoint analysis. Academic literature (and Sawtooth Software's technical papers) suggest

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[68] Groehn Report, ¶ 23.

[69] Groehn Report, ¶ 31 and Figure 6.

two possible commonly-used and tested approaches to calculating willingness-to-pay in conjoint analysis: computing dollar values corresponding to attribute utilities, and creating market simulations of realistic competitive scenarios.[70]

40. The first approach involves computing dollar values for attribute utilities, one may compare the change in price between different attribute levels to the change in utility. For example, if for a particular respondent a $10 price level is 3 utility points and a $5 price level is 1 utility point, each utility point for that respondent is equal to ($10-$5)/(3-1)=$2.50. So if the difference in utility between two levels of an attribute (e.g. American Express vs. Visa) was two utility points, then such a respondent would be willing to pay five dollars more to get an Amex than a Visa. More generally, to determine the value of a particular feature in the market, one may adjust a product's price to find the price point at which the sample would be indifferent (i.e. equally divided 50-50 in preference) between the original product and the product without the feature at the lower price point.

41. The second method uses market simulations to incorporate a competitive context.[71] A competitive scenario would be simulated with a few products in a realistic marketplace, and a simulation would determine baseline preference shares. After adjusting a particular attribute level for a product, for example, simulations would be run while adjusting the price of that product until the preference shares return to the baseline shares. The difference in price that

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[70] Orme, Bryan K., "Assessing the Monetary Value of Attribute Levels with Conjoint Analysis: Warnings and Suggestions," *Sawtooth Software,* 2001; Orme (2020), pp. 84-88.

[71] Allenby, Greg M., et al., "Economic Valuation of Product Features," *Quantitative Marketing and Economics*, August 28, 2014, ("Allenby et al. (QME)"), p. 422; Allenby, Greg M., et al., "Valuation of Patented Product Features," *Journal of Law and Economics*, Vol. 57, August 2014, ("Allenby et al. (JLE)"), pp. 649-652.

achieves the same baseline shares would reflect the willingness-to-pay for that attribute level in a realistic competitive scenario.

42. While both of these methods have advantages and disadvantages,[72] Dr. Groehn acknowledges neither specifically, and instead vaguely alludes to the possibilities that "the compensation is based on the difference in willingness-to-pay of the marginal consumer in the actual and the but-for world"[73] and "we can compute economic loss estimates based on several thousand draws to obtain the confidence interval around the point estimate."[74] These statements are too generic and provide insufficient detail to evaluate Dr. Groehn's approach to determining economic loss. To be clear, Dr. Groehn does not present the individual steps of his analytical approach. He simply refers vaguely to economic loss percentages that assess the choice of a single hypothetical light bulb versus doing nothing (without any competitive context).[75] His description would not allow an opposing expert to vet or replicate what he has done. The vagaries around Dr. Groehn's proposed analytical approach shield him from evaluation and scientific critiques, and provide nothing but a vague empty promise. The small amount of information Dr. Groehn provides in his description of the damages calculation does make clear that in Dr. Groehn's world all purported class members will be considered harmed and entitled to damages at the same level, independent from the question

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[72] When estimating willingness-to-pay by attributing a dollar value to consumer utility these disadvantages include potentially finding nonsensical results when utility functions are nonlinear, unreasonable values for individuals (such as a higher value attributed to a less desirable feature), and improperly identified price sensitivities that do not accurately reflect willingness-to-pay. When estimating willingness-to-pay with a market simulation these disadvantages include the need to accurately capture price sensitivity, the importance in including relevant attributes in the conjoint analysis, and the need to include relevant competitive options in the conjoint analysis. *See* Orme (2020), pp. 84-85, 88.

[73] Groehn Report, ¶ 32.

[74] Groehn Report, ¶ 72.

[75] *See* for competitive context, Allenby et al. (JLE), p. 630: "These incremental profits are based not just on consumer valuation of features (demand) but also on cost and competitive factors (supply)."

whether they did or did not consider either of the at-issue representations in their real world purchase decision.[76]

i. Dr. Groehn ignores the supply side of the market in his approach

43. Dr. Groehn introduces his economic framework by discussing basic microeconomic theory.[77] In particular he highlights the concept of "willingness-to-pay"[78] and acknowledges the importance of the original market equilibrium (i.e., the balance between supply and demand in the marketplace).[79] However, in proposing a methodology for calculating potential economic loss, he makes significant but fatally flawed assumptions regarding the supply-side of the LED light bulb marketplace in the "actual" and "but-for" worlds. Specifically, he states that:

> "For simplicity, we assume that the manufacturer acts under perfect competition and that the manufacturer's marginal costs are constant in the relevant range of production […] According to [Hall and Lazear's *Reference Manual on Scientific Evidence*] the damage analysis has to 'exclude any change in the plaintiff's value arising from other sources'. Hence, the profit of the manufacturer in the but-for world is irrelevant and does not need to be considered. Therefore, the supply in the but-for world does not need to be considered in my damage analysis."[80]

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[76] Groehn Report, ¶ 74; Groehn Deposition, pp. 56-57 ("Q. How will you identify class members that were not injured? A. The hypothesis is that all class members -- assuming that these advertising claims are false, so assuming that the longevity claims are false, then the demand in the but-for world would be lower, so the demand shifts downwards. And in that case, all consumers who have purchased the product would have paid a lower price in the but-for world than they paid actually in the actual world. And so all purchases have been -- would have been harmed, assuming that these claims that defendants made were false and material -- and strong enough that the shift demand.") Please note that Dr. Groehn's calculations would not find the price for a light bulb in the but-for world, because he fails to determine the supply-side changes in the but-for world market.

[77] *See* Groehn Report, Section 3.

[78] Groehn Report, ¶ 32.

[79] Groehn Report, ¶ 32.

[80] Groehn Report, ¶¶ 35-36.

44. Dr. Groehn's claim that "the supply in the but-for world does not need to be considered" assumes that there would be no change to any light bulb manufacturers' behavior if the longevity representation were removed from the light bulb packaging.[81] However, the removal of the longevity representation may result in changes to manufacturer behavior (including manufacturers other than Cree). For example, the removal of the representation could result in a price adjustment on Cree's part as well as other manufacturers.

45. Ignoring the supply-side of the market fundamentally fails to capture the but-for world. Academic literature suggests that failure to consider supply-side dynamics results in price-premium measures that "cannot be measures of the market value of a product feature, as they do not directly relate to what incremental profits a firm can earn on the basis of the product feature."[82] As a result, Dr. Groehn's estimations would likely "overstate the price premium afforded by [the longevity representation]" as "[c]omputation of changes in the market equilibrium due to feature enhancement of one product is required to develop a measure of the economic value of the feature."[83] The limitations of conjoint analysis in this respect are well-documented. It is understood that "[c]onjoint analysis predicts preference, not market share" due to its lack of explicit examination of supply-side considerations (e.g., assumes equal and proper distribution, and proper promotion).[84]

46. Despite his substantial discussion of market supply and demand and the resulting "market equilibrium,"[85] Dr. Groehn does not describe how he would determine what the market

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81 Groehn Report, ¶ 36.

82 Allenby et al. (JLE), p. 647; *See* also, Allenby et al. (QME), p. 449.

83 Allenby et al. (JLE), p. 649.

84 Orme (2020), pp. 25-26.

85 Groehn Report, ¶ 32.

equilibrium would be in the "actual" world or the "but-for" world he proposes. As a result, his potential economic loss calculations lack the proper context and do not take into account the various market factors discussed in Section 3 of his report.[86]

ii. Dr. Groehn fails to define the market he intends to model with his approach

47. As discussed earlier, LED light bulbs exist in a broad marketplace for light bulbs. Very few consumers light their homes exclusively with LED light bulbs, but many use LED bulbs along with incandescent, halogen, or florescent light bulbs.[87] Most light bulbs have standardized sizes and bases, so a consumer can choose between bulb types when considering which light bulb to purchase for their home.[88] As discussed earlier, when Dr. Groehn fails to consider light bulbs other than LEDs, he invalidates his proposed analysis.

48. Dr. Groehn's microeconomic discussion never defines the competitive marketplace for light bulbs. His analytic approach includes equations that describe a manufacturer's profit maximization, while he assumes that the "manufacturer acts under perfect competition."[89] What Dr. Groehn ignores in his description is how the demand from consumers depends on not just a single manufacturer, but on the product availability and pricing from all manufacturers in the marketplace for light bulbs.[90] Dr. Groehn plans to present LED light bulbs to respondents in his conjoint survey, but he fails to consider incandescent, halogen, or

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86 *See* Groehn Report, Section 3.

87 In 2015, 28.6% (33.8 million) of U.S. homes had "at least one LED bulb" installed indoors. Only 1.0% (1.2 million) of U.S. homes had all light bulbs as LEDs. *See* EIA Lighting.

88 "Types of Light Bulbs," The Home Depot, https://www.homedepot.com/c/ab/types-of-light-bulbs/9ba683603be9fa5395fab90e1115f39, accessed on April 23, 2021.

89 Groehn Report, ¶¶ 34-35.

90 Allenby et al. (QME), pp. 445 and 455.

florescent bulbs.[91] While LED light bulbs have seen increased market penetration in recent years, halogen bulbs have also grown to represent a greater share of the marketplace (while CFL and incandescent bulbs still represent a significant portion of the marketplace).[92] Additionally, most households with LED bulbs also have other light bulbs installed.[93] As such, their in-store choices are not merely from LED bulbs.

49. Failing to properly define the marketplace undermines any potential result of a conjoint analysis. When designing a method for a conjoint survey, a researcher "should choose a method that adequately reflects how buyers make decisions in the marketplace."[94] A realistic simulation of the marketplace depends on the inclusion of major competing products.[95] Limiting the products included in the damages calculation to a subset of the products actually presented to a consumer in the marketplace undermines the ability of the survey to provide an accurate economic valuation of a particular attribute or attributes.[96]

Joel H. Steckel
April 30, 2021

[91] Groehn Report, Table 2.

[92] Energy Star, Figure 4.

[93] Energy Star, Figure 8; EIA Lighting.

[94] Orme (2020), p. 47.

[95] Allenby et al (QME), pp. 433-434; Allenby et al (JLE), pp. 644-645.

[96] Allenby et al (QME), pp. 433-434; Allenby et al (JLE), pp. 644-645.

APPENDIX A

CURRICULUM VITAE

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EDUCATION

UNIVERSITY OF PENNSYLVANIA, THE WHARTON SCHOOL

Doctor of Philosophy Degree (Marketing/Statistics) awarded, May 1982.
Dissertation Title: "A Game Theoretic and Experimental Approach to the Group Choice Phenomenon in Organizational Buying Behavior;" Professor Yoram Wind, advisor.

Master of Arts Degree (Statistics) awarded May 1980.

Master of Business Administration Degree (Management Science) awarded with Distinction, May 1979.

Elected to Beta Gamma Sigma, May 1979.

COLUMBIA UNIVERSITY

Bachelor of Arts (Mathematics) awarded Summa Cum Laude, May 1977.

Elected to Phi Beta Kappa, May 1977.

ACADEMIC POSITIONS

Vice Dean for Doctoral Education, Stern School of Business, New York University, August 2012-Present.

Accounting Department, Acting Chairperson, Stern School of Business, August 2016 – August 2019.

Director PhD Programs, Stern School of Business, New York University, May 2007-July 2012.

Marketing Department Chairperson, Stern School of Business, New York University, July 1998-June 2004.

Professor and Associate Professor, Stern School of Business, New York University, January 1989 - present. Taught courses in Business Strategy, Marketing Management, Marketing Research, Corporate Reputation and Branding, Models of Pricing and Promotion, Field Studies in the New Economy, Marketing Engineering, and Analytic Marketing for Management Consulting. Also taught Doctoral Seminars in Mathematical Models in Marketing and Research Methods.

Visiting Professor, Wharton School, University of Pennsylvania, January 1995 - December 1995. Taught Core Marketing course.

Visiting Professor, Escola de Pós-Graduação em Ciências Económicas e Empresariais, Universidade Católica Portuguesa, May - June 1992, May - June 1993. Taught Industrial Marketing and Marketing Strategy.

Associate Professor and Assistant Professor, Graduate School of Business, Columbia University, July 1981 - December 1988. Taught MBA-level courses in Industrial Marketing, Marketing Planning, and Marketing Research. Taught three Ph.D.-level Marketing Seminars and Applied Multivariate Statistics.

Visiting Associate Professor, School of Organization and Management, Yale University, September - December 1988. Taught graduate course in Marketing Strategy.

Visiting Assistant and Associate Professor, Graduate School of Management, University of California at Los Angeles, July 1984 - June 1985, January - March 1987. Taught Advanced Marketing Management, Marketing Research, and Strategic Marketing Planning.

Assistant Instructor, Department of Statistics, University of Pennsylvania, July 1979 - June 1980. Assisted in undergraduate and MBA-level courses in Statistics. Taught undergraduate course in Calculus.

Teaching Assistant, Department of Mathematics, Columbia University, September 1976 - May 1977. Assisted in courses in Number Theory and Differential Equations.

PROFESSIONAL INTERESTS

Marketing Strategy and Marketing Research. In particular, marketing research methodology, marketing and branding strategies, digital marketing, legal aspects of marketing, and managerial decision making.

PUBLICATIONS

Books

Shift Ahead: How the Best Companies Stay Relevant in a Changing World (with A. Adamson), New York: AMACOM, 2018.

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Other

"How Smart Marketers Gauge the Future to Shift Ahead of Consumer Needs" (with A. Adamson), American Management Association Playbook, December 18, 2017, http://playbook.amanet.org/training-articles-marketers-shift-ahead-consumer-needs/.

"Paul Green: The Hulk Hogan of Marketing," essay in the Legends of Marketing Series.

"Jerry Wind A Man Ahead of His Time," essay in the Legends of Marketing Series.

"Forecasting Online Shopping," Stern Business, Fall/Winter 2000, pp. 22-27.

"Method to Their Madness," The Industry Standard, August 7, 2000.

Book review of The Application of Regression Analysis by D.R. Wittink, Journal of Marketing Research, Vol. 26, No. 4, November 1989.

Co-author (with many others) of The Statistics Problem Solver, Research and Education Association, New York, 1978.

CONFERENCE PRESENTATIONS

"Trademark Law's Shallow Empiricism: An Experimental and Theoretical Investigation," (with B. Beebe, R. Germano, and C. Sprigman), Tri State Region IP Workshop, January 2021.

"The Evolving Business Ph.D.," The Third Annual Global PhD Colloquium," Fordham University, April 2019.

"Testing for Trademark Dilution in the Court and Lab," (with B. Beebe, R. Germano, and C. Sprigman), Munich Summer Institute, June 2018.

"Trademark Dilution: Searching for the Elusive Unicorn," Conference on Empirical Legal Studies, Cornell University, October 2017.

"Measuring Trademark Dilution", Conference on Empirical Analysis of Intellectual Property, NYU Law School, October 2014.

"Using Surveys in Intellectual Property Cases: What's the Damage," AIPLA Spring Meeting, May 2013, Seattle WA.

"Trademark Dilution: An Elusive Concept in the Law," Conference on Brands and Branding in Law, Accounting, and Marketing Kanan Flagler School, University of North Caroline, April 2012

"The Role of Consumer Surveys in Trademark Infringement Cases: Evidence from the Federal Courts," (with R. Bird), AMA Summer Educator's Conference, August 2010, Boston.

"Global Market Share Dynamics: Winners and Losers in a Tumultuous World," (with P. Golder and S. Chang), INFORMS Marketing Science Conference, June 2010, Cologne, Germany.

"Use and Abuse of Consumer Perception Research in Antitrust and Advertising Cases," ABA Antitrust Section Spring Meeting, March 2009, Washington, DC.

"New Product Development: The Stock Market as Crystal Ball," (with D. Markovich), INFORMS Marketing Science Conference, Atlanta, GA., June 2005.

"Modeling Credit Card Usage Behavior: Where is my VISA and Should I Use It?," (with Y. Chen), INFORMS Marketing Science Conference, College Park, Md., June 2003.

"Using Capital Markets as Market Intelligence: Evidence from the Pharmaceutical Industry," (with D. Markovich and B. Yeung), INFORMS Marketing Science Conference, College Park, Md., June 2003.

"Using Capital Markets as Market Intelligence: Evidence from the Pharmaceutical Industry," (with D. Markovich and B. Yeung), Share Price Accuracy and Transition Economies Conference, U. of Mich. Law School, Ann Arbor, Mi., May 2003.

"Modeling Internet Site Visit Behavior," (with E. Bradlow and O. Sak), Joint Statistical Meetings, Indianapolis, August 2000.

"Consumer Strategies for Purchasing Assortments within a Single Product Class," (with Jack K.H. Lee), INFORMS Fall Conference, Philadelphia, November 1999.

"When Do Purchase Intentions Predict Sales?" (with V. Morwitz and A. Gupta), AMA Advanced Research Techniques Forum, Santa Fe, NM, June 1999.

"Modeling New Product Preannouncements as a Signaling Game," (with H. Jung), University of Mainz Conference on Competition in Marketing, Germany, June 1999.

"A Multiple Idea Point Model: Capturing Multiple Preference Effects from within an Ideal Point Framework," (with J. Lee), Joint Statistical Meetings, Dallas, TX, Aug. 1998.

"Modeling New Product Preannouncements as a Signaling Game," (with H. Jung), INFORMS Marketing Science Conference, Fontainbleau, France, July 1998.

"Dynamic Decision-Making in Marketing Channels: Traditional Systems, Quick Response, and POS Information," (with S. Gupta and A. Banerji), NYU Conference on Managerial Cognition, May 1998.

"When Do Purchase Intentions Predict Sales?" (with V. Morwitz and A. Gupta), INFORMS International Meetings, Barcelona, July 1997.

"Mental Models in Competitive Decision Making: A Blessing and A Curse," Conference on Competitive Decision Making, Charleston, SC, June 1997.

"When Do Purchase Intentions Predict Sales?" (with V. Morwitz and A. Gupta), INFORMS Marketing Science Conference, Berkeley, March 1997.

"Model Adequacy versus Model Comparison: Is the 'Best' Model Any 'Good'?, " (with A. Ansari and P. Manchanda), INFORMS Marketing Science Conference, Berkeley, March 1997.

"Dynamic Decision-Making in Marketing Channels: Traditional Systems, Quick Response, and POS Information," (with S. Gupta and A. Banerji), First Conference in Retailing and Service Sciences, Banff, 1994.

"Dynamic Decision-Making in Marketing Channels: Traditional Systems, Quick Response, and POS Information," (with S. Gupta and A. Banerji), Behavioral Decision Research in Management Conference, Boston, 1994.

"Modeling Consideration Set Formation: The Role of Uncertainty," (with B. Buchanan and S. Sen), TIMS Marketing Science Conference, Tucson, 1994.

"A Cross-Cultural Analysis of Price Conjectures to Environmental Changes," (with V. Rao), TIMS Marketing Science Conference, St. Louis, 1993.

"Decision-Making in a Dynamic Distribution Channel Environment," (with S. Gupta and A. Banerji), TIMS Marketing Science Conference, St. Louis, 1993.

"Cross Validating Regression Models in Marketing Research," (with W. Vanhonacker), TIMS Marketing Science Conference, London, 1992.

"The Influence of Stock Price on Marketing Strategy," (with D. Gautschi and D. Sabavala), TIMS Marketing Science Conference, Wilmington, DE, 1991.

"A Polarization Model for Describing Group Preferences" (with V. Rao), ORSA/TIMS National Fall Meetings, Philadelphia, 1990.

"A Polarization Model for Describing Group Preference," (with V. Rao), Behavioral Decision Research in Management Conference, Philadelphia, 1990.

"Conflict Resolution and Repeat Buying" (with S. Gupta), TIMS Marketing Science Conference, Champaign, Ill., 1990.

"Variety Seeking at the Group Level" (with S. Gupta), Association for Consumer Research Fall Meetings, New Orleans, 1989.

"On Using Attraction Models to Allocate Resources in a Competitive Environment," TIMS Marketing Science Conference, Durham, NC, 1989.

"Multidimensional Scaling with Convex Preferences" (with W.S. DeSarbo), ORSA/TIMS National Fall Meetings, St. Louis, 1987.

"A Social Comparison Model for Describing Group Preference Evaluations" (with V. Rao), TIMS Marketing Science Conference, Jouy-en-Josas, France, 1987.

"The Day the Earth Stood Still," Association for Consumer Research Fall Meetings, Toronto, 1986.

"A Friction Model for Describing and Forecasting Price Movements" (with W. DeSarbo, V. Rao, Y. Wind, and R. Colombo), ORSA/TIMS National Fall Meetings, Miami Beach, 1986.

"An Eigenvalue Method for Measuring Consumer Preferences" (with E. Greenleaf and R. Stinerock), TIMS Marketing Science Conference, Dallas, 1986.

"Creating Conjoint Analysis Experimental Designs without Infeasible Stimuli" (with W. DeSarbo and V. Mahajan), TIMS Marketing Science Conference, Dallas, 1986.

"The Mediating Role of Information in Marketing Managers' Decisions" (with R. Glazer and R. Winer), TIMS Marketing Science Conference, Dallas, 1986.

"Incorporating Interdependencies of Utility Functions into Models of Bargaining" (with S. Gupta), ORSA/TIMS National Fall Meetings, Atlanta, 1985.

"The Formation of Key Marketing Variable Expectations" (with R. Glazer and R. Winer), ORSA/TIMS National Fall Meetings, Atlanta, 1985.

"Does the Nash Equilibrium Really Describe Competitive Behavior?: The Case of Cigarette Advertising," TIMS Marketing Science Conference, Nashville, 1985.

"A Heterogeneous Conditional Logit Model of Choice" (with W. Vanhonacker), ORSA/TIMS National Fall Meetings, Dallas, 1984.

"Using a 'Robust' Response Function to Allocate Resources in a Competitive Environment," TIMS Marketing Science Conference, Chicago, 1984.

"Longitudinal Models of Group Choice Behavior," (with D. Lehmann and K. Corfman), ORSA/TIMS National Fall Meetings, Orlando, 1983.

"Considerations of Optimal Design of New Task Industrial Products," ORSA/TIMS National Fall Meetings, San Diego, 1982.

"Game Theoretic Choice Models in Organizational Buying Behavior," TIMS Special Interest Conference in Marketing Measurement and Analysis, Philadelphia, 1982.

OTHER RESEARCH IN PROGRESS

Measuring Likelihood of Confusion (with B. Beebe, R. Germano, and C. Sprigman)

Marketing Research in the Courtroom vs. the Boardroom: What are the Differences and Do They Matter? (with R. Bird)

The Impact of Trademark Litigation Outcomes on Brand Equity and Marketing Decision Making (with R. Bird)

Modeling the Tradeoffs between Marketing Research and Flexible Manufacturing.

INVITED SEMINARS

Columbia University	Spring 1991, Summer 1994
Cornell University	Fall 1983, Spring 1989
Georgetown University	Fall 2006
Pennsylvania State University	Fall 1996, Fall 2006
Rutgers University	Spring 1994
Temple University	Fall 1995
University of California, Berkeley	Spring 1990
University of California, Los Angeles	Spring 1985, Spring 1996
University of California, San Diego	Fall 2003
University of Florida	Spring 1992
University of Mainz, Germany	Summer 1998
University of Michigan	Spring 1993
University of Pennsylvania	Spring 1992, Spring 1995, Spring 1998
University of Southern California	Spring 1987
Washington University, St. Louis	Spring 2003

EDITORIAL SERVICE

Editorships

Co-Editor, *Marketing Letters,* July 2010 – March 2017

Guest editor, special section of Marketing Science on the history of marketing science theory and practice, 2001.

Consulting editor in marketing, Addison-Wesley Longman Academic Publishers, Boston, MA, 1993-1999.

Guest editor, special issue of Journal of Retailing on the use of panel and point of sale data, 1992.

Other

Member of Advisory Board (current), Marketing Letters.

Have served on editorial board or as ad-hoc referee for Journal of Marketing, Journal of Marketing Research, Stanford Law Review, Management Science, Marketing Science, Journal of Consumer Research, Journal of Retailing and Consumer Services, Manufacturing and Service Operations Management, Decision Sciences, Journal of Business and Economic Statistics, Journal of Econometrics, Journal of Retailing, Strategic Information Systems, Review of Marketing Science, Corporate Reputation Review, and Journal of Business Research.

SERVICE

Dissertation Committees Chaired

Joseph Pancras (co-chair)	(Marketing - New York University)
Sergio Meza (co-chair)	(Marketing – New York University)
Dmitri Markovich	(Marketing – New York University)
Heonsoo Jung	(Marketing - New York University)
Jack Lee	(Marketing - New York University)
Asim Ansari (co-chair)	(Marketing - New York University)
Shahana Sen (co-chair)	(Marketing - New York University)

Dissertation Committees Served on

Tingting Fan (Marketing – New York University)
Kei-Wei Huang (Information Systems – New York University)
Sherrif Nassir (Marketing – New York University)
Jane Gu (Marketing – New York University)
Orkun Sak (Marketing – University of Pennsylvania)
Atanu Sinha (Marketing - New York University)
Louis Choi (Marketing - Columbia University)
Sunder Narayanan (Marketing - Columbia University)
Carol Rhodes (Ed. Psych. - Columbia University)
Rita Wheat (Marketing - Columbia University)
Robert Stinerock (Marketing - Columbia University)
Bruce Buchanan (Business Economics - Columbia University)
Chen Young Chang (Marketing - University of Pennsylvania)

Other Discipline Related Service

Chairperson, Marketing Committee, INFORMS, January 2006 – June 2010.
Past President, INFORMS Society on Marketing Science, January 2004 – December 2005.
Founding President, INFORMS Society on Marketing Science, January 2003 – December 2003.
President, INFORMS College on Marketing, January 2002 – December 2002.
President Elect, INFORMS College on Marketing, January 2000- December 2001.
Secretary-Treasurer, INFORMS College on Marketing, January 1998-December 1999.
Association of Consumer Research, Annual Program Committee, 1999.
Co-Organizer of 1996 Conference on Consumer Choice and Decision Making, Arden House, Harriman, New York, June 1996.
Organized Marketing Sessions at Fall 1989 TIMS/ORSA Joint National Meetings, New York, October 1989.

Other University Related Service

Member, NYU Doctoral Affairs Committee, September 2017 – Present.

Member, Research Resources Committee, Stern School of Business, September 2009 – Present.

Chair, Statistical and Quantitative Reasoning Task Force, Stern School of Business, September 2005 – August 2007.

Member, Specialization Committee, Stern School of Business, September 2004 - Present.

Member, PhD Oversight Committee, Stern School of Business, January 2006 – May 2007.

Member, Executive Committee, Digital Economy Initiative, Stern School of Business, January 2000 – August 2002.

Member, Board of Directors, Center for Information Intensive Organizations, Stern School of Business, September 1998 – December 1999.

Member of MBA Committee, Stern School of Business, New York University, 1989-December 1998. Committee was responsible for supervising redesign of MBA programs in 1991 and 1995, Chairman September 1997-August 1998.

Member of Stern MBA Curriculum Review Committee, September 1997-December 1998. Committee redesigned MBA Core.

Member of Stern School Committee on Improving Consulting Activities, July 1998-December 1998.

Member of Building Committee, Stern School of Business, New York University, 1990-1992.

Member of Research Committee, Stern School of Business, New York University, 1990-1991.

Elected member of Columbia University Senate. Served on Budget Review and Alumni Relations Committees, 1986-1988.

AWARDS

Awarded the J. Parker Bursk Memorial Prize as the outstanding student participating in the Department of Statistics, University of Pennsylvania, 1979.

Dissertation was awarded Honorable Mention in the 1982 American Marketing Association Dissertation Competition.

Dissertation was named Winner of the 1983 Academy of Marketing Science Dissertation Competition.

Invited speaker at the J. Parker Bursk Memorial Prize Luncheon, Department of Statistics, University of Pennsylvania, 1992.

Invited speaker at American Marketing Association Doctoral Consortium, University of Southern California, 1999.

Cited for outstanding editorial support, Fordham University Pricing Center, Sept. 2002.

Named one of the inaugural winners of the Best Reviewer Award for the *Journal of Retailing,* 2003.

Work recognized by West publishing as one of the outstanding 2012 law review articles on Intellectual Property.

Work recognized with the Highly Commended Paper Award at the Literati Network Awards for Excellence 2013.

SELECTED CONSULTING AND OTHER PROFESSIONAL ACTIVITIES

AOL MovieFone, Inc., New York, NY. Performed general consulting on analyzing caller data for telephone movie information service; Consulted as expert in conjunction with damage assessment in legal proceedings.

Citicorp, New York, NY. Built choice model for bank services. Gave lectures on Marketing Strategy to CitiCards executives.

Directions for Decisions, Inc., New York, NY and Jersey City, NJ. Consulted on segmentation study of sports apparel market, designed and implemented "Construction Test", a concept design decision tool. Performed general consulting on marketing research practice on an ongoing basis.

eComplaints.com, New York, NY. Member board of advisors.

Federal Trade Commission, Washington, D.C. Served as consultant on branding strategies in antitrust investigation.

J.C. Penney Co., New York, NY. Performed sales-advertising response analysis. Work was done on request for Management Decision Systems, Inc., Weston, MA.

The Open Center, New York, NY. Consulted on marketing strategy and direct marketing practices.

Pfizer Pharmaceuticals, New York, NY. Conducted seminar on conjoint analysis.

SilverBills, Inc., New York, NY. Member board of advisors.

Union Carbide Corporation, Danbury CT. Built econometric model to forecast prices.

Various Expert Witness Engagements. Clients include Amazon, AT&T, Avon, Brother International, Dyson, Epson, Hershey's, BM, JP Morgan Chase, Gerber Products, Johnson & Johnson, K-Swiss, Mead Johnson, Merck KGAA, Microsoft, Monster Cable, McDonald's, New Balance, Playtex, PNC Financial, Proctor & Gamble, Roche, Seagate, Sergio Garcia, Sharp, TiVo, Under Armour, Wal-Mart, Warnaco, and various plaintiffs in consumer class actions.

MEMBERSHIPS

American Marketing Association

American Statistical Association

Association for Consumer Research

The Institute for Operations Research and Management Science (INFORMS)

Society for Consumer Psychology

American Association for Public Opinion Research

APPENDIX B

TESTIMONY IN THE LAST FOUR YEARS

Depositions

Mizner Court Holdings, LLC, and San Marco Holdings, LLC, v. Country Club Maintenance Association, Inc., d/b/a Broken Sound Master Association, Case No. 15-CA-000864 (AB), Circuit Court of the 15th Judicial Circuit in and for Palm Beach County.

Wasser, Joshua, Ila Gold, and Roberto Israel Barajas-Ramos, on behalf of themselves and all others similarly situated, vs. All Market Inc., Case No.: 16-cv-21238- Scola/Otazo-Reyes, United States District Court (Southern District of Florida, Miami Division).

Car-Freshener Corporation and Julius Samann Ltd. vs. American Covers, LLC F/K/A American Covers, Inc. D/B/A Handstands, Energizer Holdings, Inc., and Energizer Brands, LLC, Civil Action No.: 5:17-cv-171 (TJM/ATB), United States District Court (Northern District of New York).

Spangler Candy Company vs. Tootsie Roll Industries, LLC, Case No. 3:18-cv-1146, United States District Court (Northern District of Ohio, Western Division - Toledo).

Merck & Co., Inc. and Merck Sharp & Dohme Corp., v. Merck KGaA, Case No. 2:16-cv-00266-ES-MAH, United States District Court (District of New Jersey).

Quidel Corporation vs. Siemens Medical Solutions USA, Inc., Siemens Healthcare Diagnostics, Inc., and Does 1-50 Inclusive, Case No. 3:16-cv-3059 BTM AGS, United States District Court (Southern District of California).

Jeff Young, individually and on behalf of all others similarly situated, vs. Cree, Inc., Case No. 4:17-cv-06252-YGR, United States District Court (Northern District of California – Oakland Division).

The Renault Thomas Corporation d/b/a Discount Tire, vs. Mavis Tire Supply LLC., Civil Action No. 1:18-cv-05877-TCB, United States District Court (Northern District of Georgia – Atlanta Division).

Ryan Porter and Haarin Kwon, individually and on behalf of all others similarly situated, vs. NBTY, Inc., United States Nutrition, Inc., Healthwatchers (DE), Inc., and Met-Rx Nutrition, Inc. Case No. 15-cv-11459 MSS YBK, United States District Court (Northeastern District of Illinois – Eastern Division).

Mahindra & Mahindra Ltd. and Mahindra Automotive North America v. FCA US LLC, Case No.: 2:18-CV-12645-GAD-SDD, United States District Court (Eastern District of Michigan); In the Matter of Certain Motorized Vehicles and Components Thereof, Investigation No. 337-TA-1132, United States International Trade Commission, Washington D.C.

Susan Wang, Rene Lee and all others similarly situated, v. StubHub, Inc., Superior Court of the State of California for the County of San Francisco (Case No: CGC-18564120).

Match Group, LLC, v. Bumble Trading Inc., Bumble Holding, LTD., Badoo Trading Limited, Magic Lab Co., Worldwide Vision Limited, Badoo Limited, Badoo Software Limited, Badoo Software Limited, and Badoo Technologies Limited, United States District Court for the District of Texas Waco Division, No. 6:18-CV-00080-ADA.

Brian Gozdenovich, on behalf of himself and all others similarly situated v. AARP, Inc., AARP Services, Inc., AARP Insurance Plan, UnitedHealth Group, Inc. and United Healthcare Insurance Company, United States District Court, District of New Jersey, Case No. 2:18-cv-02788-MCA-MAH.

American Dairy Queen Corporation v. W.B. Mason Co., Inc., United States District Court (District of Minnesota), Civ. Act. No. 0:18-cv-00693-SRM-ECW.

Maglula, LTD. v. Amazon.com, Inc., and Amazon.com Services, LLC (United States District Court For the Eastern District of Virginia, Alexandria Division -Civil Action No.: 1:19-cv-01570-LO-IDD.

Capri Sun GMBH v. American Beverage Corporation, United States District Court for the Southern District of New York; 1:19-cv-1422.

Hearings

In the Matter of Distribution of the 2010, 2011, 2012, 2013 Cable Royalty Funds, (Before the Copyright Royalty Judges, Washington D.C.) Docket No. 14-CRB-0010-CD (2010-13)

In the Matter of Certain Motorized Vehicles and Components Thereof, Investigation No. 337-TA-1132, United States International Trade Commission, Washington D.C.

Preliminary Injunction Hearing

Danone US, LLC. v. Chobani, LLC., Case Action No. 18 CV 11702, United States District Court (Southern District of New York).

APPENDIX C
MATERIALS RELIED UPON

Case Documents

Class Action Complaint, *Stephanie Wedra, Individually and on behalf of all others similarly situated, v. Cree Inc.*, Civil Action No. 7:19-cv-03162, United States District Court Southern District of New York, April 9, 2019.

Memorandum of Law in Support of Plaintiff's Motion for Class Certification, *Stephanie Wedra, individually and behalf of all others similarly situated, v. Cree Inc.*, Case No. 7:19-cv-03162-VB, United States District Court Southern District of New York, February 26, 2021.

Expert Reports

Report of Dr. Andreas Groehn, *Stephanie Wedra, Individually and on behalf of all others similarly situated, v. Cree Inc.*, Civil Action No. 7:19-cv-03162, United States District Court Southern District of New York, February 26, 2021.

Depositions

Virtual Videotaped Deposition of Dr. Andreas Groehn, *Stephanie Wedra, Individually on behalf of herself and all others similarly situated, v. Cree Inc.,* Case No.:19-cv-03162, United States District Court Southern District of New York, April 9, 2021.

Academic Articles and Books

Allenby, Greg M., Jeff D. Brazell, John R. Howell, and Peter E. Rossi, "Economic Valuation of Product Features," *Quantitative Marketing and Economics*, Vol. 12, No., 4, August 28, 2014, pp. 421-456.

Allenby, Greg M., Jeff D. Brazell, John R. Howell, and Peter E. Rossi, "Valuation of Patented Product Features," *Journal of Law and Economics*, Vol. 57, August 2014.

Diamond, Shari S., "Reference Guide on Survey Research," *Reference Manual on Scientific Evidence*, 3rd Edition, National Academies Press, 2011, pp. 359-423.

Green, Paul E. and V. Srinivasan, "Conjoint Analysis in Consumer Research: Issues and Outlook," *Journal of Consumer Research*, Vol. 5, No. 2, 1978, pp. 103-123.

Huber, Joel and John McCann, "The Impact of Inferential Beliefs on Product Evaluations," *Journal of Marketing Research*, Vol. 19, No. 3, 1982, pp. 324-333.

Lehmann, Donald R., Sunil Gupta, and Joel H. Steckel, *Marketing Research*, Addison-Wesley Educational Publishers Inc., 1998.

Meyer, Robert J., "A Model of Multiattribute Judgments under Attribute Uncertainty and Informational Constraint," *Journal of Marketing Research*, Vol. 18, No. 4, 1981, pp. 428-441.

Orme, Bryan K., "Assessing the Monetary Value of Attribute Levels with Conjoint Analysis: Warnings and Suggestions," *Sawtooth Software*, 2001.

Orme, Bryan K., *Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research*, 4th ed., Research Publishers LLC, 2020.

Rao, Vithala R., *Applied Conjoint Analysis*, Springer, 2014.

Yates, J. Frank, Carolyn M. Jagacinski, and Mark D. Faber, "Evaluation of Partially Described Multiattribute Options," *Organizational Behavior and Human Performance*, Vol. 21, 1978, pp. 240-251.

Other Publicly Available Sources

"American Households Use a Variety of Lightbulbs as CFL and LED Adoption Increases," *Today in Energy*, U.S. Energy Information Agency, May 8, 2017, https://www.eia.gov/todayinenergy/detail.php?id=31112, accessed on March 25, 2021.

Home Depot Website, https://www.homedepot.com/b/Lighting-Light-Bulbs-LED-Light-Bulbs/Cool-White/Standard/A15/A19/N-5yc1vZbm79Z1z0vvqnZ1z0vvrdZ1z0wujbZ1z17hnz?NCNI-5&storeSelection=, accessed on April 29, 2021.

"Table HC5.1 Lighting in U.S. homes by housing unit type, 2015" *U.S. Energy Information Administration*, February 2017, https://www.eia.gov/consumption/residential/data/2015/hc/php/hc5.1.php, accessed on April 23, 2021.

"The Light Bulb Revolution," Energy Star, October 2017.

"Types of Light Bulbs," The Home Depot, https://www.homedepot.com/c/ab/types-of-light-bulbs/9ba683603be9fa5395fab90e1115f39, accessed on April 23, 2021.